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NOTES FROM PACIFIC COAST OBSERVATORIES.

THE COLOR OF THE STARS IN THE GREAT NEBULA IN *ORION*.

In order to determine roughly the types of the stars in the *Orion* nebula, their colors were determined in the following manner. By means of bathed plates and a yellow screen, photographs of the region were secured on which the stars have about the same relative magnitudes as are found visually. Other photographs were made in the ordinary manner on Seed's 27 plates. The magnitudes were estimated by means of a scale which was calibrated by the estimates of the comparison stars for T *Orionis* which occur in the region under investigation. The mean magnitude of the stars was made the same for the visual (stained plates with screen) and photographic series; that is, the mean magnitude of all the 11^m stars in one series was made the same as the mean of the same stars in the other series. The difference between the photographic and visual intensity for any individual star gives the color on a scale which must be calibrated by stars of known color and type.

Since the stars in this region whose spectra are known are all blue and of nearly the same type, it was necessary to calibrate the color scale by means of another region. Plates of the field of the Ring Nebula in *Lyræ* were taken in same manner as in the case of the *Orion* field. In the *Lyra* field there are three faint stars of known type, concerning which Director E. C. PICKERING kindly furnished the data in a letter. As these stars were of types A, F, and M_a, it was possible to deduce the connection between spectral type and color as determined by the present method; for the increase in redness in passing from A to M has been found by Professor KING and others to be quite regular. In the *Lyra* field the color of stars of type A is about zero; that of type M_a is + 2.0. In the *Orion* field the (relative) color of stars of type B is zero; that is, the great majority of the stars in this region have about the same color, and some of them are known to be type B. In the *Lyra* field, or in any field taken at random over the whole sky, the same is very likely to be true, about half of the stars are nearly the same in color and are A type, ranging perhaps from B8 to A5. The difference between the two fields must be borne in mind in interpreting the table of colors.

The stars in the *Orion* region appear to vary in color with the density of the surrounding nebulosity in the manner to be expected if the nebula exerted general absorbtion, but it cannot be said at present that this effect is not entirely due to "seeing" or to photographic causes. In the table that follows the colors have been corrected for this effect.

Regions free from nebulosity on a dense plate contain comparatively few stars. There is nothing unusual about the color of the stars in these empty spaces, aside from the point mentioned in the preceding paragraph. The edges of the regions of densest nebulosity contain a relatively large number of faint stars; it is of course impossible to say what numbers of faint stars are blotted out by the fogging of the plate in these dense regions.

In the table the color is given in such a way that a star whose color is positive is redder than the mean. Under each heading, >+.75, +.75, +.50, etc., is given the number of stars of the magnitude indicated at the left falling within this color division.

TABLE OF COLORS—*ORION* FIELD.

Mag.......	>+.75	+.75	+.50	+.25	± 0	—.25	—.50	—.75	<—.75
< 11......	1	1	1	12	14	12	3	1	0
11 to 12....	0	0	1	12	13	8	1	0	0
12 to 13....	0	1	4	16	22	16	6	1	0
All........	1	2	6	40	49	36	10	2	0

LYRA FIELD.

< 11......	1	2	1	2	2	3	1	0	0
11 to 12....	1	2	4	2	2	5	2	2	0
12 to 13....	0	1	2	3	4	4	2	1	1
13 to 14....	2	4	8	11	18	18	8	1	1
All........	4	9	15	18	26	30	13	4	2

As the color increases +.5 per type in going from A to F, F to G, etc., on this scale, we can make an estimate of the numbers of stars of any given type. In the *Lyra* field (20′ square), which is probably representative of the sky as a whole, of the stars brighter than fourteenth magnitude two are probably of type K, ten or eleven of type G, some twenty-five of type F, about sixty-five of type A, and fifteen of type B and other blue stars. The color of the nebula star is — 1.2. This is in accord with the results obtained by Keeler. No other star is bluer than —.8.

The stars of θ_1 and θ_2 *Orionis* and Bond 905 are of type O_e5, B1, and B3 respectively, and have color —.2, +.1, and ±.0 respectively. Thus it seems that zero color must correspond to type B in this region. On this assumption there can be no more than one of the stars examined having a spectrum as advanced as G; only five that can be F; about 30 that may be A or B, while some eighty stars are almost certainly between O_e and B5. If the faint stars resemble those in other regions, in that half of them are A type, there may be several F type stars in this region; but there is little probability of more than one solar star—and certainly no star more advanced than solar—among those observed. A very red variable star was too faint to show on the plates used in this discussion. In the case of any individual star a rapid variation in intensity may have acted to give an erroneous color value. The fact that eighty-five per cent of the stars in the *Orion* region brighter than the thirteenth magnitude are comprised within a range of color corresponding to one and one-half spectral types is rather remarkable, the more so when one considers that there is good reason to think they are all in the neighborhood of B type. Only sixty per cent of the stars in the *Lyra* region are comprised within this range. The number of stars falls off rapidly as the stars become redder or bluer than the great central group in the *Orion* region, but relatively more rapidly on the red side. It is these last considerations which lead us to the conclusion that practically all the *Orion* stars are of type O_e to B5. There can be little question that most of the stars projected upon the nebula are actually within it and intimately connected therewith.

Some twenty variable stars were observed. They do not differ in color from the other stars, and are therefore blue, so they probably have short periods.

The plates used in this discussion were taken by Astronomer CURTIS with the Crossley reflector. The measurements were made at Minnesota, where this discussion was incorporated in a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy. KEIVIN BURNS.

MT. HAMILTON, September 26, 1910.

THE DEATH OF MR. JOHN MACDONALD.

The Lick Observatory has suffered loss through the death of the oldest member of its community, Mr. JOHN MACDONALD, who came to Mount Hamilton in 1880, as an employee of the James Lick Trust, when the principal duties of the Trust consisted in blasting off the irregular summit of the mountain, in order to prepare places for the buildings. On June 1, 1888, when the Lick Trust transferred the completed observatory to the government of the University of California, Mr. MACDONALD was appointed engineer, and foreman of the outside workmen. He remained in this capacity to the day of his death, at home, on September 18, 1910.

Mr. MACDONALD's continuous life of more than thirty years on Mount Hamilton thus covered the entire material history of the Lick Observatory. He leaves a wife, who has resided on Mount Hamilton continuously since the year 1885; a daughter Mary, who was the first child born to Lick Observatory people; and a daughter Eileen.

Mr. MACDONALD's affections for the Lick Observatory and all that concerned Mount Hamilton were highly developed. His services were at all times faithful and to the full extent of his ability. If calls were made upon him before or after working hours, on holidays, or at night, in sunshine or in severe storm, he was always willing and ready. Born in Nova Scotia in 1852, he possessed the strong character which we are accustomed to associate with natives of that land. The respect of the observatory community and observatory neighbors he always had. A line from Professor EDWARD S. HOLDEN, the